



Technical Service Bulletin

Date: 10/29/09

Product Description: AMSOIL Premium API CJ-4 Diesel Oils (DEO, DME)

Subject: Fuel dilution issues in 2007 - 2010 light-duty turbo-diesel pickups.

OBJECTIVE:

Communicate the discovery and cause of excessive fuel dilution in 2007–2010 light-duty diesel pickups from Ford, GM and Dodge and the resultant reduction in the drain interval recommendation for AMSOIL Premium Diesel Oils in these applications.

ISSUES:

AMSOIL has documented increasing levels of diesel fuel contamination (fuel dilution) in the engine oil in 2007–2008 light-duty diesel pickups from all major vehicle manufacturers, and indications are that 2009 - 2010 models are affected as well.

Research indicates that fuel dilution is intensifying due to the use of in-cylinder post-fuel injection during the engine's exhaust stroke to regenerate the diesel particulate filter (DPF).

Fuel in the oil reduces the oil's life expectancy and effectiveness. Because diesel fuel is a natural solvent, fuel dilution in motor oil causes a decrease in viscosity which may lead to an increase in engine wear rates.

TECHNICAL DISCUSSION:

Current emissions legislation set by the Environmental Protection Agency (EPA) mandates that all 2007 and newer on-highway diesel-fueled vehicles come equipped with a DPF. A DPF is generally a honeycomb-like filter positioned in the exhaust stream to collect particulate matter and soot to prevent it from exiting the vehicle. DPFs are highly efficient and can usually remove 80-90 percent of particulate matter from diesel exhaust.¹ When the filter is near its capacity, soot trapped in the filter is burned, freeing the plugged media and enabling the filter to remain serviceable. The process of burning the residual matter is termed **regeneration** and can be either active or passive.

Active regeneration uses raw diesel fuel as a combustion source to burn the accumulated soot and clear the filter. Active regeneration is accomplished using either in-stream or in-cylinder injection. **In-stream injection** systems inject raw diesel fuel directly into the exhaust stream before it reaches the DPF. **In-cylinder injection** systems inject raw diesel fuel directly into the cylinder on the exhaust stroke. The unburned fuel evaporates and travels down to the

DPF to burn out the soot built up in the filter.

Passive regeneration requires exhaust gas temperatures of approximately 600°C (1100°F).² These relatively high exhaust gas temperatures occur naturally in trucks operating under heavy load and can trigger the combustion of soot in DPFs. Passive regeneration does not increase fuel consumption the way active regeneration does because, by design, it does not require the injection of additional fuel to increase exhaust temperatures.

All class 8 over-the-road tractors and medium-class applications use active regeneration via in-stream injection. In this method, diesel fuel used to burn soot in the DPF is injected directly ahead of the DPF and does not reach the crankcase, leaving the oil uncontaminated.

Light-duty diesel pickup manufacturers (Dodge, Ford, GM) have opted for a less-costly in-cylinder injection system. With in-cylinder injection systems, raw diesel fuel injected on the exhaust stroke can wash directly past the rings and into the crankcase, mixing with the oil. Regular washing of cylinders is a continuous source of fuel contamination in the crankcase and is not conducive to long-term engine protection. Used oil analysis results from 2007–2010 light-duty diesel vehicles showed some elevated fuel dilution, but at tolerable levels.

NOx reduction - EPA emission mandates taking effect in 2010 require the reduction of nitrogen oxides (NOx) to .2 grams per brake horsepower (g/bhp). To meet this limit, engine manufacturers will use either selective catalytic reduction (SCR), NOx adsorbers or advanced exhaust gas recirculation (EGR).

Most over-the-road truck and tractor manufacturers will use SCR technology, with International the only major manufacturer to use high EGR technology. Neither system is expected to increase fuel dilution. Light-duty diesel pickup manufacturers Ford and GM also will use SCR technology in their 2011 model-year trucks. Dodge plans to employ SCR technology in its medium-duty chassis cabs but plans to continue use of its NOx adsorber technology in the company's light-duty pickups.

Submitted By: MB

Reviewed By: DP

Approved By: AA

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Like DPFs, NOx adsorbers need to be regenerated. However, they require significantly more fuel to regenerate than DPFs do, which only compounds the fuel dilution problem. In Dodge light-duty turbo-diesel pickups, the combined regeneration requirements of the DPF and NOx adsorber technologies are causing high fuel dilution of the engine oil.

engines operating in normal service conditions), and some applications are affected more than others. While not all 2007–2010 light-duty diesel vehicles develop this problem, fuel contamination can reduce oil viscosity and decrease film thickness. Other concerns include significantly reduced fuel economy, accelerated engine oil oxidation, increased volatility and overfilling of the oil sump.

